

**WHAT IS CLAIMED IS:**

- 1    1. A method of exposing a target material to an ion beam in an ion implantation system, the  
2       method comprising the steps of:  
3           quantifying an amount of ion beam neutralization; and  
4           controlling a characteristic of the ion beam of the implantation system based upon  
5           the amount of ion beam neutralization.
  
- 1    2. The method of claim 1, wherein the target material is a semiconductor substrate.
  
- 1    3. The method of Claim 1, wherein the target material is any substance to be implanted  
2       using the ion beam.
  
- 1    4. The method of claim 1, wherein the step of quantifying is conducted by a first device  
2       capable of detecting an ion beam and a second device capable of detecting an ion beam.
  
- 1    5. The method of claim 1, wherein a characteristic is selected from a group consisting of:  
2       beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.

- 1       6. The method of claim 1, wherein the step of quantifying includes:
  - 2           determining a reference ratio at a first ion beam current at a first location of a
  - 3           processing chamber and a second location of a processing chamber, wherein
  - 4           the first location is further from a first target of the ion beam than the second
  - 5           location;
  - 6           determining a current ratio of a second ion beam current at the first location and the
  - 7           second location, wherein the second ion beam current is being used to
  - 8           process a second target;
  - 9           determining a charge neutralization component of the ion beam at the second target
  - 10          location based on the reference ratio and the current ratio.
- 1       7. The method of Claim 6, wherein the reference ratio is determined when a relatively high-level, stable vacuum exists along the ion beam line and no target material is present.
- 1       8. The method of Claim 6, wherein the reference ratio is determined at the beginning of implantation when a relatively high-level, stable vacuum exists along the ion beam line and target material is present.
- 1       9. The method of claim 1, wherein the step of controlling includes:
  - 2           modifying the ion dose based upon the charge neutralization component to create a
  - 3           total dose; and
  - 4           adjusting a process parameter based on the total dose.
- 1       10. The method of claim 9, wherein a process parameter is selected from a group consisting  
2          of: beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.

- 1 11. The method of Claim 4, wherein the second device is fixed in place and sited adjacent to  
2 the target position.
  - 1 12. The method of Claim 4, wherein the second device is moveable and sited adjacent to the  
2 target position during measurement.
  - 1 13. The method of Claim 4, wherein the second device is fixed in place and sited behind the  
2 target position.
  - 1 14. The method of Claim 4, wherein the second device is moveable and sited behind the  
2 target position.
  - 1 15. The method of Claim 4, wherein the second device is sited along the beam path to the  
2 target position.
  - 1 16. The method of Claim 6, wherein the reference ratio is in the range of approximately  
2 100:1 to 1:1.
  - 1 17. The method of claim 16, wherein the range of the reference ratio is dependent upon the  
2 location of the first device with reference to the second device.
  - 1 18. The method of Claim 16, wherein the reference ratio may be a previously stored value  
2 retrieved from control software.

- 1        19. A system comprising:
  - 2              memory;
  - 3              a processor operably connected to said memory;
  - 4              a program of instructions, said program of instructions including instructions to
  - 5                  manipulate said processor to:
  - 6                  quantify an amount of ion beam neutralization; and
  - 7                  control a characteristic of the ion beam of an ion implantation system based upon the
  - 8                  amount of ion beam neutralization.
- 1        20. The system of claim 19, wherein the step of quantifying is conducted by a first device capable of detecting an ion beam and a second device capable of detecting an ion beam.
- 1        21. The system of claim 19, wherein a characteristic is selected from a group consisting of:
  - 2              beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.
- 1        22. The system of claim 19, wherein the step of quantifying includes:
  - 2              determining a reference ratio at a first ion beam current at a first location of a processing chamber and a second location of a processing chamber, wherein the first location is further from a first target of the ion beam than the second location;
  - 6              determining a current ratio of a second ion beam current at the first location and the second location, wherein the second ion beam current is being used to process a second target;
  - 9              determining a charge neutralization component of the ion beam at the second target location based on the reference ratio and the current ratio.

- 1        23. The system of claim 19, wherein the step of controlling includes:
  - 2                modifying the ion dose based upon the charge neutralization component to create a
  - 3                        total dose; and
  - 4                adjusting a process parameter based on the total dose.
  
- 1        24. The system of claim 23, wherein a process parameter is selected from a group consisting  
2                of:
  - 3                beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.